Stone Matrix Asphalt

> January 28, 2005 NCAUPG Meeting Lafayette, IN

SMA in Wisconsin

- Crusher Adjustments
- Plant Adjustments
- Design and Testing
- Paving Operations
- Rolling Patterns
- Compaction



Wisconsin SMA Projects

Year	Total	Job	County	Lake Superior Outer I. Apostle Islands Nat, Lakeshore
1991	1	Various	Various	Duluth Superior Bayfield, Madeline I.
1992	3	Various	Various	2 2 Atshland
1993	5	Various	Various	MINNESOTA 39 63 63 MICHIGAN
		IH 894	Milwaukee	Turtle Flambeau Flowage
1994	3	IH 43	Milwaukee	St. Croix Nat. Scenic Rivervaay Flambeau R (1) NORTH WOODS 2 8 Escanaba
		STH 21	Juneau	St. Koix R. 63 Rice Lake 8 8 8 Mehonninee R.
1995	2	USH 53	Chippewa	
1995	2	USH 41	Washington	Minneanolis 94 Menerovie Chippewa Falls Wausau 51 45 Wolf R. 441 (4) DOOR COUNTY
1996	1	USH 41	Winnebago	10 Chippewa R. Marshfield (23) Shawano Green Bay (23) Chippewa R. Marshfield (23) Chippewa R. Marshfield (23) Chippewa R. Marshfield (23) Chippewa R. Marshfield (23) Chippewa R. Chippewa R. Marshfield (23) Chippewa R. Chip
1997	1	IH 94	Eau Claire	63 L. Pepin 94 L. consin Rapids Ployer Ashwaubenon 29 New London 45 147 De Pere
2000	2	USH 41	Brown	Mississippi R, 53 Black R, Falls 39 Neenah 10 Kaukauna 42 Neenah 10 L Dougant 10 L
2000	2	STH 29	Pierce	90 Sparta Toman Casto ok L. Pipe Contact and State Unnebago
2001	2	IH 94	St. Croix	La Crosse 90 Wisconsin Fond du Lac Plymouth Sheboygan Wisconsin Dells Portage Waypun Plymouth Lake Michigan
2001	2	IH 94	Dunn	Reedsburg Bearboon (#1) Baraboo (B) (151 (1.51)
		IH 94	St. Croix	
2002	4	IH 43	Brown	18 (18 Hourt Horeb TE Waukesha Wauwatosa 18 Hitchburg Fitchburg Ft, Atkinson Oak Creek New Glarus Stoughton Ft Atkinson Oak Creek New Glarus (19) Company (19)
2002		IH 90	Monroe	(4.) Spring Green Sun Prairie an Waterdow Romonoee Falls Prairie du Chien Wisconsin R. 18 13 Fitchburg Richards Waterdow Romonoee Falls Mount Horebe 18 18 13 Fitchburg Richards Waterdow Romonoee Falls 18 13 Fitchburg Richards Waterdow Romonoe Falls 18 13 Fitchburg Richards Waterdow Romonoe Falls 19 12 Waterdow Romonoe Falls 18 13 Fitchburg Richards Romonoee Falls 19 12 Waterdow Romonoe Falls 19 12 Water
		USH 10	Clark	Uubuque ILLINOIS 380 ILLINOIS Rockford

Wisconsin SMA Projects

Wisconsin 0 10 20 30 40 Hiles © World Sites Atlas (sitesatlas.com)

DOOR COUNTY

	Year	Total	Job	County		Lake Superior Outer I. Apostle Islands Nat, Lakeshore Wisconsin 0 10 20 30 4	40
	1991	1	Various	Various		Apostle Islands Nat. Lakeshore Miles © World Sites Atlas (sitesa 13 Bayheld Madeline I.	
	1992	3	Various	Various		2 2 Ashland	
	1993	5	Various	Various		MINNESOTA ST	
			IH 894	Milwaukee		Hayward	
	1994	3	IH 43	Milwaukee		St. Croix Nat. Scenic RiverWay Flambeau R. (1) NORTH WOODS (2) (8) Escanaba	
			STH 21	Juneau		St. Crox R. (3) Rice Lake 8 8 8 Mehorminee R.	
	1995	2	USH 53	Chippewa			
			USH 41	Washington		Minneapolis 94 Menomonie Chippewa Falls Wausau (1) Wolf R. (41) DOOR (41) A11 (41) DOOR (45) Weston	
	1996	1	USH 41	Winnebago		St. Rau River Falls Eau Claire Monipee	Bay
	1997	1	IH 94	Eau Claire		10 Chippewa R. 12 Marshfield 11 45 22 23 141 57 42 10 10 10 10 10 10 57 42 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 Mississippi R. 53 Description 45 10 10 10 10 10 10 10 10 10	
	2000	2	USH 41	Brown			
			STH 29	Pierce		Rochester 90 Sparta Castle Rock L. Pingne 28 (45) Last Winnebago	
	2001	2	IH 94	St. Croix		Pond du Lac • Sheboygan	
			IH 94	Dunn		Reedsburg • Baraboo Ta www.kin.ala	an
		4	IH 94	St. Croix	AU V	(61) Spring Green Sun Prairie Watertown Menomonee Falls	
	2002		IH 43	Brown		(18) Fitchburg Fitchburg Fitchburg Gans Stoughton Wauwatosa New Glans, Stoughton Wauwatosa	
	2002		IH 90	Monroe		IOWA Mississippi R. (61) (1917) (61) (61) (62) (63) (74) (75) (75) (75) (75) (75) (75) (75) (75	
			USH 10	Clark		Waterloo Beloit 380 Waterloo	

Wisconsin SMA Projects

Year	Total	Job	County	Lake Superior Outer I. Apostle Islands Nat, Lakeshore
1991	1	Various	Various	Duluth Bayfield Madeline I, © World Sites Atlas (sites atlas.com)
1992	3	Various	Various	Superior (1) 2 2 • Ashland 2 2 • Marquette
1993	5	Various	Various	MINNESOTA 39 53 57 53 MICHIGAN
		IH 894	Milwaukee	F31 Hayward C 45
1994	3	IH 43	Milwaukee	St. Croix Nat. Scenit Rivervax Flambeau R. Phinelander 45
	Sec. 2	STH 21	Juneau	St. Cloix R. 53 Chippewa K. 8 8 8 19 19 Mehominee R. Washington I.
1995	2	USH 53	Chippewa	
1990		USH 41	Washington	Minneapolis 94 Menomonie Chippewa Falls Wausau (51 45 Wolf R. 441 41 DOOR COUNTY
1996	1	USH 41	Winnebago	St. Raul River Falls Eau Claire Mosinee 23 Shawano Green Bay Sturgeon Bay 10 Chippewa R. 12 Marshfield 745 22 23 141 57 42
1997	1	IH 94	Eau Claire	63 L Pepin 94 12 Miles Corperate New London + 17 (31) De Pere
2000	2	USH 41	Brown -	Black River Falls 39 L. Poydan 10 - 52 (10) - Two Rivers
2000		STH 29	Pierce	Rochester 00 Sparta, Temal All Castle Rock L, Castl
2001	2	IH 94	St. Croix	Pond du Lac Pitter Sheboygan
2001	Z	IH 94	Dunn	Image: Wisconsin Dells Portage Waupun Waupun String Lake Michigan Image: Wisconsin Dells Beaver Dam (41) 45 57 13 Lake Michigan Image: Wisconsin Dells Beaver Dam (41) 45 57 13 Lake Michigan Image: Wisconsin Dells Beaver Dam (41) 45 57 13 Lake Michigan Image: Image
	4	IH 94	St. Croix	61 Spring Green Sun Prairie Waterfown Menomogee Falls 12 Prairie du Chieri, Wisconsin R. / Middleton's Madison Brookfield Minu MailKFF
2002		IH 43	Brown	Prairie du Chieri, Wijscontain R. / Middleson, Madison, Brookfeld, MILWAUKEE Mount Horeb - 18 (18) (18) Fitchburg Million - Pitchburg Waukesha Mississippi R. (61) msr Stoughton - Whitewater as Caledonia
2002		IH 90	Monroe	(61) Spring Green, Son Prairie and Materia and Son Prairie and
		USH 10	Clark	Waterioo Beloit 380 ILLINOIS Rockford

Crusher Adjustments

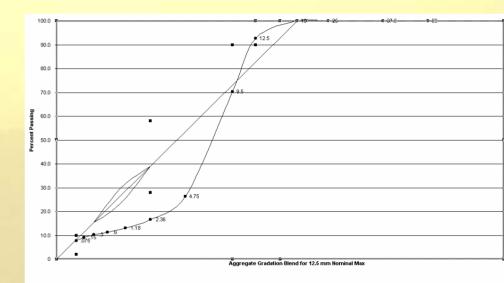


- Impact crushers ideal for cubical shaped particles
- Still want Thin & Elongated numbers to be in the teens otherwise problems with low VMA

Crusher Continued

- 80% Chips

 30% 5/8" Chip
 50% 1/2" Chip
- 10-15% Man Sand
- 0-10% Screenings
 - It is vital to have consistent products
- 6-8% Mineral Filler
- Total P200 around 8%
- 0.3% Organic Fibers



Plant Adjustments

- Portable set up located at our commercial plant - for efficiency & consistency
- We do not make other mixes while making SMA





Mineral Filler Silo

- % Mineral Filler as a product on the Mix Design to account for binder content
- Scale on Mineral Filler Silo needs to be calibrated
- Keep sufficient product in silo



Mineral Filler Silo



- Augers have to be large enough to handle both bag house dust and additive
- If blowing make sure it's being entrapped in mix and not airborne

Fiber System

- Storage on site for all fiber
- Supply power to system and room to incorporate into plant site
- People to maintain the system and flow
- Control system either tied into plant system or stand alone
 - need to be aware when the tons per hour changes on stand alone system
- Needs initial calibration

SMA Testing



- Testing in the lab Superpave mix design
- Profilographing in the field
- Taking Densities on the road
 now modified



Nuclear vs. Coring



- Nondestructive vs. Destructive
- Wisconsin tried other Nuclear options:
 - Slurry mix
 - Lower density targets
 - Warranty
 - Non-nuclear devices
- Now using test strip and coring method



Nuclear vs. Coring



- Test strip and coring method:
 1000' test strip (after first 1000') to establish rolling pattern
 - Nuclear open surface
 - Take cores to bulk for density and to show stone structure



 Use density results from test strip as target for the rest of the project



Paving Operations



- Used all Live Bottom tucks
- Did not see much segregation
- Used a
 Notched
 Wedge Joint

Rolling Patterns

- 4 Loaded Static
- Hot Roller Static DD130
- Intermediate (2)
 Loaded Static
 Hyster 350 (14
 ton)
- Finish Roller Dynapac CS151 (Loaded 3 wheeler)



Compaction

- 1 pass pattern
- Took density tests after each roller
- Did not gain any compaction after 125°F



